PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION** see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
95.0110		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/EP 98/ 05718	02/09/1998	15/09/1997
Applicant		
SOFITECH N.V. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. [ ] **Certain claims were found unsearchable** (see Box I).

2. [ ] **Unity of invention is lacking** (see Box II).

3. [ ] The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing
   - [ ] filed with the international application.
   - [ ] furnished by the applicant separately from the international application,
     - [ ] but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
   - [ ] Transcribed by this Authority

4. With regard to the **title,**
   - [X] the text is approved as submitted by the applicant
   - [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**
   - [X] the text is approved as submitted by the applicant
   - [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is:

   Figure No. --
   - [ ] as suggested by the applicant.
   - [ ] because the applicant failed to suggest a figure.
   - [ ] because this figure better characterizes the invention.
   - [ ] None of the figures.

INTERNATIONAL SEARCH REPORT

Inte[redacted]nal Application No
PC[redacted]P 98/05718

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C09K7/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 C09K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DATABASE WPI Section Ch, Week 8502 Derwent Publications Ltd., London, GB; Class H01, AN 85-011286 XP002066439 & SU 1 097 638 A (MOSCOW GUBKIN PETROCHEM) see abstract ---	1,4,13, 19-21
Y	WO 94 06883 A (UNION OIL COMPANY) 31 March 1994 see page 5, line 12 - page 10, line 2 see page 10, line 23 - page 14, line 12 see page 17, line 21 - line 31 --- -/--	1,2,13, 15,19-21

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 December 1998	23/12/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Boulon, A

1

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4 012 329 A (J.B.HAYES) 15 March 1977 cited in the application see column 1, line 35 - line 50 see column 3, line 30 - column 4, line 57 see column 5, line 7 - line 35 see column 6, line 15 - line 20	1-4, 13-15, 19-21
Y	US 2 717 239 A (P.W.FISCHER) 6 September 1955 see column 2, line 1 - column 4, line 20	1-4, 13-15, 19-21
Y	US 2 721 841 A (P.W.FISCHER) 25 October 1955 see column 1, line 62 - column 2, line 55 see column 3, line 32 - line 76 see column 5, line 7 - line 73	1-4, 13-15, 19-21
Y	US 5 494 120 A (A.H.HALE) 27 February 1996 see column 2, line 6 - column 3, line 33	1,13-15, 20,21

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP 98/05718

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9406883 A	31-03-1994	US 5556832 A	17-09-1996
		AU 5133493 A	12-04-1994
		US 5710111 A	20-01-1998
		US 5696058 A	09-12-1997
US 4012329 A	15-03-1977	NONE	
US 2717239 A	06-09-1955	NONE	
US 2721841 A	25-10-1955	NONE	
US 5494120 A	27-02-1996	NONE	

REPLACED BY ART 34 AMDT

PATENT COOPERATION TREATY

REC'D 10 NOV 1999

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
WO 95.0110		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP98/05718	02/09/1998	15/09/1997
International Patent Classification (IPC) or national classification and IPC C09K7/06		
Applicant SOFITECH N.V. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 4 sheets.

3. *This report contains indications relating to the following items:*

   - I ☒ Basis of the report
   - II ☐ *Priority*
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
01/04/1999	08.11.99
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Natus, G Telephone No. +49 89 2399 8597

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP98/05718

I. Basis of th report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-22	as originally filed				

Claims, No.:

1-21	as received on	15/09/1999	with letter of	14/09/1999	

Drawings, sheets:

1/1	as originally filed

2. The amendments have resulted in the cancellation of:

☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

see separate sheet

4. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	15
	No:	Claims	1-14,16-21
Inventive step (IS)	Yes:	Claims	15
	No:	Claims	1-14,16-21
Industrial applicability (IA)	Yes:	Claims	1-21
	No:	Claims	

2. Citations and explanations

see separate sheet

I.3 The amendments filed with the letter dated 14.9.99 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT. The amendments concerned are the following: claims 1 and 13.
The references to the description indicated by the applicant are contained in the part of the description which provides a general description of the existing kinds of drilling fluids. Since from the existing context it is impossible to deduce that the said invert emulsions are used in the present invention, the introduction of this subject matter into the claims is not acceptable, because it produces novel subject matter.
Presently, the only disclosed and acceptable subject matter relating to invert emulsions is contained in claim 15 and on page 6/14-17 of the application.

V.1 The most pertinent documents are D1 : US-A-4012329 (Column 4/31-47 ; 10/15-61 ; claim 14) and D2 : WO-A-9406883 (example 28 ; table I).

D1 is considered as the closest prior art, because it provides drilling fluid compositions with a higher than normal conductivity which is needed for electrical logging.

The compositions of D1 are water in oil emulsions, with the oil of the continuous phase containing up to 25 % by volume of polar solvents.

D2 does not address the conductivity problem, but describes drilling fluids containing polar organic fluids, (TABLE I), among the examples, n-octanol is used which also appears in the present application.

Although these documents are not using the parameters which delimit the present invention, it cannot be excluded that the one skilled in the art, when performing the invention of D1 and D2 uses drilling fluids which comply with the present parameters.

The present application therefore does not satisfy the criterion set forth in art. 33(2) PCT because the subject matter of claims 1-14,16-21 is not new in respect of the above prior art documents D1 and D2 as defined in the regulations (Rule 64(1)-(3) PCT).

V.2 The present definition of the invention optically differs from the disclosures of D1 and D2 by the definition of the parameters. Presently it is not possible to deduce

from the content of the file that these technical features make a contribution to this state of the art. The indication of the electrical physical features which should be fulfilled in order to be suited for electrical logging seems to lay within the means of the one skilled in the art in this field of technology. Hence, the indication of these features in the claims, does not seem to involve an inventive step.

Thus, the subject-matter of claims 1- 14, 16-21 does not involve an inventive step and does not satisfy the criterion set forth in Article 33(3) PCT.

V.3 Insofar as the applicant would limit the claimed subject matter to the invert emulsions of claim 15, novelty and inventive step of the claimed subject matter would be acceptable, since these emulsions differ from the micro emulsions of D1 and the all-oil compositions of D2. D1 (column 3/19,20), moreover indicates that invert emulsions are not preferred for economical reasons. Hence, it is not obvious to provide invert emulsions which can be used for electrical logging.

CLAIMS

1. A wellbore fluid having a non-aqueous continuous liquid phase that comprises a polar organic liquid POL which exhibits a dielectric constant of at least about 5.0 and a Hildebrand Solubility Parameter of at least about 17 $(J\ cm^{-3})^{1/2}$ so that the liquid phase exhibits an electrical conductivity of not less than 10 $\mu S\ m^{-1}$ at 1 kHz.

2. A wellbore fluid as in claim 1, wherein the non-aqueous liquid phase further comprises a water immiscible organic liquid OL.

3. A wellbore fluid as in claim 2, wherein the non-aqueous liquid phase is comprised of 1 to 99% by volume of POL + 99 to 1% by volume OL, and more preferably of 5 to 95% by volume of POL and 95 to 5% by volume of OL.

4. A wellbore fluid as in any preceding claim, wherein the non-aqueous liquid phase further comprises a dissolved component (DC) selected from: water; inorganic salts wherein the anion(s) is (are) a conjugate base of an acid whose dissociation constant (pK_a) in water at 298 °K is less than about 1.0, and the cation is ammonium ion or a metal ion which has an ionic radius of less than about $^2/_3$ of the ionic radius of the pre-selected anion; quaternary ammonium salts or hydroxides; N-alkyl pyridinium salts or hydroxides; and organic bases exhibiting a pK_a in water at 298 °K of more than 10.0, and their salts.

5. A wellbore fluid as in claim 4, wherein the non-aqueous liquid phase comprises of about 0.1 % to about 50% by volume of the dissolved component DC.

6. A wellbore fluid as in claim 5, wherein the non-aqueous liquid phase comprises 1 to 98.5% by volume POL , 1 to 98.5% by volume OL and 0.5 to 50% by volume DC.

7. A wellbore fluid as in any of the preceding claims wherein the polar organic liquid POL is one or more selected from the class including alcohols, phenols, glycols, polyalkylene glycols, mono (alkyl or aryl) ethers of glycols, mono (alkyl or aryl) ethers of polyalkylene glycols, monoalkanoate esters of glycols, monoalkanoate esters of polyalkylene glycols, ketones possessing also hydroxyl group(s), diketones.

8. A wellbore fluid as in any preceding claim, wherein the polar organic liquid POL component is selected from the class including:

- aliphatic and alicyclic alcohols of carbon numbers C_5-C_{10} such as *n*-pentanol, cyclohexanol, *n*-octanol, 2-ethylhexanol, and *n*-decanol;
- phenols such as orth-, meta-, or para-cresol;
- glycols such as 1,3-butane diol, 1,4-butane diol, 2-ethylhexane-1,3-diol;
- polyalkylene glycols such as polypropylene glycols of molecular weight above about 1000, polybutylene glycols, polytetrahydrofuran, polyalkylene glycols or copolymers of ethylene oxide and/or propylene oxide and/or butylene oxide initiated by any hydroxylic or amino-functional moiety wherein the polyalkylene glycol or copolymer is further characterised by exhibiting a cloud point (at 1% concentration in water) of less than about 10 °C;
- mono-alkyl or mono-aryl ethers of glycols or polyalkylene glycols such as ethylene glycol monobutyl ether, diethylene glycol monobutyl ether, dipropylene glycol monomethyl ether, tripropylene glycol monomethyl ether, propylene glycol monobutyl ether, dipropylene glycol monobutyl ether, tripropylene glycol monobutyl ether, propylene glycol phenyl ether, dipropylene glycol phenyl ether;
- diacetone alcohol (4-hydroxy-4-methyl-1,2-pentanone); acetylacetone; acetonylacetone.

9. A wellbore fluid as in any of claims 1 to 7, wherein the polar organic liquid POL is an aprotic solvent.

10. A wellbore fluid as in claim 4 wherein the inorganic salt comprises anions which are the conjugate base of an acid selected from the class including hydrochloric acid; hydrobromic acid; hydroiodic acid; thiocyanic acid; perchloric acid; nitric acid; permanganic acid; sulphuric acid; alkane sulphonic acids such as methane sulphonic acid and ethane sulphonic acid; arene sulphonic acids such as benzene sulphonic acid and naphthalene sulphonic acid; alkylaryl sulphonic acid such as toluene sulphonic acid; alkane and arene sulphonic acids substituted with electron-withdrawing groups such as trifluoromethane sulphonic acid and 2,4-dinitrobenzene sulphonic acid; picric acid and trichloracetic acid.

11. A wellbore fluid as in Claim 4 wherein the quaternary ammonium salts or hydroxides are the chlorides, bromides, iodides, methosulphates, ethosulphates or hydroxides of quaternary ammonium cations having alkyl and/or aryl and/or alkylaryl groups such that the total number of carbon atoms in all the groups combined with the nitrogen atom is in the range 8 to 60, and more preferably in the range 12 to 40.

12. A wellbore fluid as in Claim 4 wherein the organic base(s) exhibiting a pK_a in water of more than 10.0 is selected from the class including mono-, di-, and tri-alkylamines wherein the alkyl groups contain from 2 to 18 carbon atoms; alkylpiperidines; alkylpyrrolidines; N-alkylated ethyleneamines; and their salts.

13. A wellbore fluid having a non-aqueous continuous liquid phase that comprises from about 99.5% to about 50% by volume of a water immiscible organic liquid OL and about 0.5% to about 50% by volume of a dissolved component as claimed in 4.

14. A wellbore fluid as in any preceding claims, wherein the water immiscible organic liquid OL is one, or a mixture of two or more, liquid(s) selected from the class including crude oil; hydrocarbon fractions refined from crude oil; synthetic hydrocarbons such as *n*-paraffins, alphaolefins, internal olefins, and polyalphaolefins; synthetic liquids such as dialkyl ethers, alkyl alkanoate esters, acetals; and natural oils such as triglycerides including rape-seed oil, sunflower oil and the like.

15. A wellbore fluid according to any preceding claim wherein a discontinuous liquid phase such as water or a brine is added together with one or more emulsifier to form a water-in-organic-liquid emulsion wherein the discontinuous phase is present at up to 70% by volume of the emulsion.

16. A wellbore fluid as in any preceding claim wherein it further comprises a dispersion in the wellbore fluid of finely divided particles of an electrically conducting solid insoluble in the organic liquid or water.

17. A wellbore fluid as in Claim 16 wherein the finely divided electrically conducting solid is selected from the class including metals; carbon preferably in the form of graphite or carbon fibre; metal coated carbon fibre or graphite; conductive polymers such as polyaniline, polypyrrole, organometallic phthalocyanines and the like.

18. A wellbore fluid as in Claim 16 or 17 wherein the finely divided conducting solid is in the form of high aspect ratio fibres, flakes or platelets.

19. A wellbore fluid according to any preceding claim further comprising a functional wellbore fluid components such as clay, organoclay or polymeric viscosifiers; filtration reducers, weighting agents or a lubricating additive.

20. A method of drilling or completing a well wherein the wellbore fluid used is as in any preceding claim.

21. A method of providing enhanced information from electrical logging tools, measurement while drilling, logging while drilling, geosteering and the like wherein the efficiency is enhanced by the improved electrical conductivity of the wellbore fluids as in any of claims 1 to 19.

PA NT COOPERATION TREAT

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

United States Patent and Trademark Office
(Box PCT)
Crystal Plaza 2
Washington, DC 20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 02 June 1999 (02.06.99)	
International application No. PCT/EP98/05718	**Applicant's or agent's file reference** 95.0110
International filing date (day/month/year) 02 September 1998 (02.09.98)	**Priority date** (day/month/year) 15 September 1997 (15.09.97)
Applicant MAITLAND, Geoffrey et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

01 April 1999 (01.04.99)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

A. Karkachi

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